Rotten Parents and Child Labor

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Abstract

We show that taking into account the consequences of child labor on both childhood welfare and human capital investment, instead of focusing exclusively on the human capital dimension, brings new insights on the economic analysis of child labor. In particular, there are new sources of potential inefficiencies that appear when we assume that labor induces some disutility. In such a case, household decisions regarding child labor may indeed be inefficient even if household members are altruistic, transfers are not at a corner and there are no market imperfections. Also, the presence of child labor disutility leads to an equilibrium where the conditions for an exogenous reduction of child labor to be Pareto improving are less likely to be fulfilled. This paper stresses therefore the fact that economic analysis should not forget one of the most important aspects of child labor, namely that it does not make children happy.

Keywords: child labor, rotten kid theorem, human capital, collective household, altruism.

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1 Introduction

Childhood is certainly one of the most intense period of life. It's not uncommon to hear adults or elderly relate their early period of life as the times where they had the largest quantity of pleasures; or sometimes the worst experiences. Without any doubt, the quality of life during childhood has a great impact on the valuation of lifetime utility even if childhood is only a relatively small fraction of life. Besides this, childhood is also a learning period during which individuals acquire a large part of their human capital. Thus it is a major determinant of the ability to raise labor earnings once become adult.

In more economic terms, childhood is both a "consumption" and an "investment" period. However, most economic studies dealing with child issues, and in particular with child labor, tend to focus on either one or the other of these two dimensions[1]. Static single-period models generally allow parents' preferences to depend on the utility or disutility of children education and labor, but do not take into account the fact that decisions made for children are also chosen for their later consequences (see for example Basu and Van, 1998, Ravallion and Wodon, 2000). In fact, only multi-period models can encompass the investment dimension. Dessy (2000), Baland and Robinson (2000) and Ranjan (2001) adopt this formulation but neglect the disutility of child labor. In this type of approach, child labor appears as being problematic because it may prevent the production of human capital, but not so much because it may be unpleasant for children.

In this short paper, we argue that it is important to take into account the utility provided during the early period of life, not only to recall that child utility is a component of lifetime utility, but also because it may brings new economic insights. In particular, we show that when labor disutility is introduced in a classical household model of child labor, new kinds of economic inefficiencies appear. These economic inefficiencies are not related to market imperfections, or to inoperative altruism, but are a consequence of the non cooperative game in which altruistic family parents are involved. Also, the presence of child labor disutility

[1] See Basu (1999) for a survey of literature on child labor.

will lead to an equilibrium where the conditions for an exogenous reduction of child labor to be Pareto improving are less likely to be fulfilled.

To illustrate this point we decide to follow the model of Baland and Robinson (2000) but introducing explicitly the disutility of labor, so that childhood utility is not exogenous but actually depends on labor activities. In such a model we find that child labor may be Pareto inefficiently high even when markets are perfect and transfers interior (not zero). In partial equilibrium, introducing a marginal ban on child labor is not Pareto improving but allows to diminish the welfare loss and to displace the utility outcomes in favor of the children. A ban on child labor might be Pareto improving when accounting for general equilibrium effects, but this is the case only under quite strong assumptions on the production function.

The results that we obtain by introducing a disutility of child labor are therefore similar to those of the pure human capital investment model of Baland and Robinson, at two fundamental differences. First, it is no longer needed to have any market failure, or inoperative altruism, to obtain inefficient outcomes. Inefficiencies may indeed result from the very nature of family ties and allocation of decision power. Second, the conditions for a ban on child labor to be Pareto improving are less likely to hold than in Baland and Robinson. Both points lead to distinct implications in terms of policy recommendations.

In the remaining of the paper, section 2 introduces the basic model. Section 3 studies the efficiency of the allocation of child labor. Section 4 analyzes the effects of a marginal ban on child labor. Section 5 concludes.

2 Basic Model

Our model follows closely Baland and Robinson (2000). We also use the same notations to make comparisons easier.

There are two periods, $t = 1, 2$ with no discounting of the future. Households are composed of parents and children who live for both periods. In the first period, children are going to school, accumulating human capital but can also work for a given wage. In the second period, children are adults and work on the labor market. In the first period, parents decide how children will allocate their time endowment between labor and education. The share of their time endowment spent at working is l_c while the share spent at school to accumulate human capital is $1 - l_c$. Parents have exogenous income A (from inelastic labor supply) in each period. The accumulation of human capital for children produces efficient units of labor in the second period according to the following production function: $h(1 - l_c)$ where $h(.)$ is strictly increasing and concave. By normalization, we assume that $h(0) = 1$, meaning that children who do not accumulate human capital are endowed with one unit of efficient labor in their adulthood. In sections 2 and 3, wages for an efficient unit of labor are exogenous and set equal to one for simplicity. Wages will be endogenous and explicitly denoted in section 4 where general equilibrium effects will be considered. Then, apart from section 4, labor earnings of children are l_c and their adult earnings are $h(1 - l_c)$.

Parents have a utility function W_p depending on consumption in the first and second periods and separable. Moreover, they are altruistic towards their children. Noting c_p^i the parent's consumption during period i, we assume that:

$$W_p = U(c_p^1) + U(c_p^2) + \delta W_c$$

where W_c is children utility, $\delta \in (0, 1)$ is the parental altruism parameter, and $U(.)$ is a strictly increasing and concave function.

Children are also altruistic with respect to their parents with rate λ and their selfish utility function depends not only on their adult consumption but also on their disutility of working noted $V_1(1 - l_c)$. The introduction of this disutility constitutes the only difference with Baland and Robinson's model. Noting c_c the adulthood consumption of children, the utility of children is defined by:

$$W_c = V_1(1 - l_c) + V_2(c_c) + \lambda W_p$$

where $\lambda \in (0, 1)$, and $V_1(.)$, $V_2(.)$ are strictly increasing and concave functions.

Denoting s the savings of parents from the first period, b the bequests they leave to children, and τ the transfers that children do to their parents when adult, it is straightforward to see that parents are willing to maximize:

$$W_p = \frac{U(c_p^1) + U(c_p^2) + \delta V_1(1 - l_c) + \delta V_2(c_c)}{1 - \delta\lambda}$$

under their first and second period budget constraints $c_p^1 = A + l_c - s$ and $c_p^2 = A - b + s + \tau$, while children's objective is to maximize:

$$W_c = \frac{V_1(1 - l_c) + V_2(c_c) + \lambda U(c_p^1) + \lambda U(c_p^2)}{1 - \delta\lambda}$$

under the budget constraint $c_c = h(1 - l_c) + b - \tau$.

The timing of decisions and allocation of decision power are as in Baland and Robinson (2000). Parents choose child labor l_c and savings s in the first period. In the second period, parents choose bequests b and then children choose transfers τ conditionally on child labor, savings and bequests. Central in the model is that parents anticipate transfers from children when they choose the investment of human capital of their children (and consequently child labor) as well as savings and bequests.

Regarding the transfers in the second period, it is clear that only the net transfer $b - \tau$ matters for the adult consumption of children and for the second period consumption of parents.

3 Inefficient family choices of child labor

In Baland and Robinson (2000), when capital markets are perfect, efficiency is reached as soon as net transfers are non zero. In this section, we show that this conclusion does not hold anymore when we consider that there is a disutility of child labor.

In fact, Baland and Robinson's conclusion will still be true when net transfers flow from parents to children, but false when net transfers flow from children to parents. Indeed, in our model, children control only transfers τ. But actually when bequests, b, are greater than

τ, that is when net transfers are from parents to children, our model give the same outcome than a model where parents decide for everything. Efficiency is then obviously reached, thanks to parental altruism, no matter the disutility of child labor.

Thus, the only case where inefficiencies might occur is in the more interesting case where net transfers from children to parents are positive (that is $\tau - b > 0$). We will exclusively focus on such a situation thereafter. Then, one can show the following proposition:

Proposition 1 *When labor has a non zero disutility and when net transfers from children to parents are positive, the "laissez-faire" level of child labor is inefficiently high.*

Proof. When net transfers $\tau - b$ are positive (then we can set arbitrarily $b = 0$ and $\tau > 0$), the first order condition on children's transfers to parents leads to:

$$V_2'(h(1-l_c) + b - \tau) = \lambda U'(A - b + s + \tau) \tag{1}$$

For parents, the respective first order conditions for l_c and s are:

$$U'(c_p^1) + U'(c_p^2)\frac{\partial \tau}{\partial l_c} = \delta V_1'(1-l_c) + \delta V_2'(c_c)[h'(1-l_c) + \frac{\partial \tau}{\partial l_c}] \tag{2}$$

and:

$$U'(c_p^1) + \delta V_2'(c_c)\frac{\partial \tau}{\partial s} = U'(c_p^2) + U'(c_p^2)\frac{\partial \tau}{\partial s} \tag{3}$$

From condition (2) and (3) we get:

$$U'(c_p^2)[1 + \frac{\partial \tau}{\partial l_c} + \frac{\partial \tau}{\partial s}] = \delta V_1'(1-l_c) + \delta V_2'(c_c)[h'(1-l_c) + \frac{\partial \tau}{\partial l_c} + \frac{\partial \tau}{\partial s}]. \tag{4}$$

Derivating (1) with respect to l_c and s we obtain:

$$\frac{\partial \tau}{\partial l_c} + \frac{\partial \tau}{\partial s}h'(1-l_c) + h'(1-l_c) = 0 \tag{5}$$

Then, (4) can be rewritten:

$$U'(c_p^2)[1 - h'(1-l_c)](1 + \frac{\partial \tau}{\partial s}) = \delta V_1'(1-l_c) + \delta V_2'(c_c)[1 - h'(1-l_c)]\frac{\partial \tau}{\partial s}$$
$$= \delta[V_1'(1-l_c) - V_2'(c_c)[1 - h'(1-l_c)] + V_2'(c_c)[1 - h'(1-l_c)](1 + \frac{\partial \tau}{\partial s})]$$

implying that we finally obtain:

$$\delta\left(V_1'(1-l_c)-V_2'(c_c)[1-h'(1-l_c)]\right)=\left[U'(c_p^2)-\delta V_2'(c_c)\right][1-h'(1-l_c)][1+\frac{\partial\tau}{\partial s}] \quad (6)$$

Since $\tau-b>0$, we know that $U'(c_p^2)-\delta V_2'(c_c)>0$ and $1+\frac{\partial\tau}{\partial s}=\frac{V_2''(c_c)}{V_2''(c_c)+\lambda U''(c_p^2)}>0$.
Denoting l_c^* the efficient level of child labor, satisfying:

$$V_1'(1-l_c^*)-V_2'(c_c)[1-h'(1-l_c^*)]=0, \quad (7)$$

it is clear that $1-h'(1-l_c^*)>0$ because we assumed that child labor has a disutility. Therefore l_c^* cannot be solution of (6).

Actually, we can show that the level of child labor that follows from our model, l_c^{**}, is greater than the efficient one, l_c^*. Indeed, with $\Phi(l_c)=V_1'(1-l_c)-V_2'(c_c)[1-h'(1-l_c)]$ and $\Psi(l_c)=\left[U'(c_p^2)-\delta V_2'(c_c)\right][1-h'(1-l_c)][1+\frac{\partial\tau}{\partial s}]$, we know, from (6), that l_c^{**} is solution of $\delta\Phi(l_c^{**})=\Psi(l_c^{**})$ and l_c^* solution of $\Phi(l_c^*)=0$. Now, note from equation (7) that $1-h'(1-l_c^*)>0$, so that $1-h'(1-l_c)>0$ for all $l_c<l_c^*$ because h is strictly concave. This implies that $\frac{\partial\Phi}{\partial l_c}(l_c)=-V_1''(1-l_c)-h'(1-l_c)V_2''(c_c)[1-h'(1-l_c)]-V_2'(c_c)h''(1-l_c)>0$ for all $l_c<l_c^*$ and, since $\Phi(l_c^*)=0$, that $\Phi(l_c)$ is negative for all $l_c<l_c^*$. Thus, the solution of $\delta\Phi(l_c)=\Psi(l_c)$ can only be reached for $l_c^{**}>l_c^*$. This completes the proof of Proposition 1. ■

Proposition 1 is true whatever the capital markets completeness. In contrast to Baland and Robinson results, this proposition shows that one does not need savings to be at a corner or any market imperfection to get an inefficient supply of child labor as soon as children's disutility of labor matters. The inefficiency of child time allocation does not necessarily rely on capital market imperfections, but may only result from the inability of family ties, driven by altruism, to reach efficient outcomes. More precisely, the inefficiency obtained here follows from a failure of the Rotten-Kid theorem (Becker, 1991) in a particular setting where the first action is decided by the parents and the transfers are chosen by the children (saying "Rotten-Parent theorem" would therefore be more adapted here). The disutility of child labor is central since it generates a break down of the "transferable utility condition" which is a necessary condition for the Rotten-Kid theorem to hold (Bergström, 1989).

Note that (6) implies that the child labor choice in this model, l_c^{**}, is such that:

$$h'(1 - l_c^{**}) < 1 \tag{8}$$

This means that child labor is at a lower level than in the model with no labor disutility where we would have $h'(1 - l_c^{**}) = 1$. In other words, the solution of two-sided altruism model does account for the disutility of child labor, but not enough to reach the efficient level.

4 The effect of a marginal ban on child labor

Once it has been shown that child labor may be inefficiently high, it is rather natural to think of a policy consisting in imposing a reduction of child labor. The object of this section is to discuss what would be the impact of a marginal reduction of child labor.

Let's first analyze the partial equilibrium effect of a marginal ban on child labor. The partial equilibrium is defined by ignoring the effects of the variation of child labor supply on child and adult wages. In such a case, an exogenous diminution of child labor has a negative impact on parents' utility since it prevents them to reach the solution that maximizes their utility. Moreover, a marginal decrease of child labor will have a positive impact on child welfare. We have therefore the following result:

Proposition 2 *In partial equilibrium (or with a linear technology), a marginal ban on child labor is welfare enhancing for children but not for parents.*

Proof. The formal proof is straightforward by differentiating parents and children utility with respect to child labor, keeping wages constant. ■

A marginal ban on child labor is therefore not Pareto improving in such a case. However, the welfare loss supported by the parents is second-order, while the gain for the children is first-order. A ban on child labor has a first negative impact on the welfare loss, and induces a displacement of the utility outcomes in favor of the children.

In a dynamic setting, all individuals are in turn children and adults. As a marginal ban on child labor has a first order positive impact on utility in the first period of life and only a second order negative impact in the second period of life, the situation with a steady marginal ban on child labor is preferable to the situation with no ban on child labor. However the transition from a situation where there is no ban on child labor, to a situation where there is a ban on child labor will be costly for the generation that will spend his childhood before the transition and his adulthood after the transition. So, in a partial equilibrium approach, the introduction of a ban on child labor does not induce a Pareto improvement, although it will benefit to all the subsequent generations, because it is costly for one generation.

As in Baland and Robinson, one may look at the general equilibrium effects of a marginal ban on child labor. An exogenous reduction of child labor supply may affect wages and lead to change the above conclusions. If the terms resulting from wages adjustments are not too large, banning child labor is expected to rise children's utility in the general equilibrium approach like in the partial equilibrium one. However, parental welfare may also increase if the first order effects that are driven by wage adjustments have a positive impact and dominate the negative second order effect obtained in the partial equilibrium. Whether it will be the case or not depends on the elasticities of the wage rate to the amount of efficient units of labor demanded. Noting w_{c1} and w_{c2} the wages per unit of efficient child and adult labor, these elasticities are defined by:

$$\varepsilon_{c1} = \frac{l_c}{w_{c1}} \frac{\partial w_{c1}}{\partial l_c} \tag{9}$$

$$\varepsilon_{c2} = -\frac{h(1-l_c)}{w_{c2}} \frac{\partial w_{c2}}{\partial h(1-l_c)} = -\frac{1}{w_{c2}} \frac{\partial w_{c2}}{\partial l_c} \frac{h}{h'} \tag{10}$$

where ε_{c1} is the elasticity of children's wage to child labor in the first period and ε_{c2} the elasticity of the adult wage to child labor.

Then, we have the following proposition[2]:

[2] The proposition is similar to Baland and Robinson's study of general equilibrium (see p. 676 of Baland and Robinson, 2000), and uses the same assumptions for the production and labor market assumptions.

Proposition 3 *Taking into account the general equilibrium effects, a marginal ban on child labor is Pareto improving whenever the three following inequalities simultaneously hold:*

$$-\varepsilon_{c1} \leq 1 \tag{11}$$

$$-\varepsilon_{c1} \leq -\varepsilon_{c2} h' \frac{w_{c2}}{w_{c1}} \tag{12}$$

$$-\varepsilon_{c2} \frac{\eta + 1}{\eta + \gamma} h' \frac{w_{c2}}{w_{c1}} \leq -\varepsilon_{c1} \tag{13}$$

where $\eta = \frac{\sigma_U}{\sigma_{V_2}}$ *is the ratio of absolute risk aversion at the optimum consumption levels of parents and children in the second period and* $\gamma = \frac{1}{\delta\lambda}$, *the inverse of the product of the caring parameters*

Proof. See Appendix A. ■

In the above three inequalities, (11) is a sufficient condition for a marginal ban on child labor to improve children's welfare, (12) insures that it will increase firms' profits, and (13) is necessary and sufficient for parents' welfare not to decrease.

Remark that re-introducing explicitly wages, inequality (8) becomes

$$0 < h'(1 - l_c^{**}) \frac{w_{c2}}{w_{c1}} < 1. \tag{14}$$

Unlike in Baland and Robinson, the fact that labor disutility is taken into account leads to a level of child labor which is below the one that would maximize monetary lifetime income. Therefore, inequality (13) is likely to hold since elasticities are negative, $h' \frac{w_{c2}}{w_{c1}} \in (0, 1)$ at the equilibrium according to (14) and $\frac{\eta+1}{\eta+\gamma} \in (0, 1)$ is small when altruism is low ($\delta\lambda$ small). Inequality (11) and inequality (12) were also in Baland and Robinson conditions for banning child labor to be Pareto improving. These conditions seem at first sight unaffected by the assumption that there is a disutility of labor. However, note that because of such a disutility we have $h' \frac{w_{c2}}{w_{c1}} < 1$ at the equilibrium and (12) may hold only if $-\varepsilon_{c1} < -\varepsilon_{c2}$. In particular, if elasticities are identical, a ban on child labor cannot be a Pareto improvement as it is costly for the firms[3]. The greater the disutility of child labor, the smaller will be $h' \frac{w_{c2}}{w_{c1}}$ at the equilibrium and the less likely it is that inequality (12) holds.

[3] We assume here that profits are not redistributed.

5 Conclusion

In this paper, we have shown that considering labor disutility, leads to conclusions differing quite significantly from those of studies which focus exclusively on human capital investment. In particular, when there is a disutility of labor, decisions regarding child labor and human capital investment may be non efficient even if household members are altruistic, transfers are not at a corner and there are no market imperfections. Also, labor disutility, may reduce the likelihood that a marginal ban on child labor would be Pareto improving.

Our paper stresses that inefficiencies are hardly avoidable because parents decide for children about their education and labor activities while they are only indirectly affected by these decisions. This may lead to a "Rotten Parents" effect where parents rationally sacrifice some of childhood utility, by making children work too much, because they anticipate that this will result in higher children lifecycle earnings and consequently in larger transfers from their children (even though lifetime utility of the children is reduced). Altruism, even two-sided altruism, does not always allow to reach the efficient outcome. Cooperation would require that children be able to punish their parents by lower private transfers if their parents made them work too much. However, such a promise of punishment is not credible from the part of an altruistic child. Once become adult, he or she has not anymore rational incentive to punish his or her elderly parents.

If cooperation between generations cannot be guaranteed, one can think about several policies in order to diminish the size of inefficiencies. A solution, examined in the paper, would consist in restricting child labor, by law. We have seen that it effectively leads to decrease the welfare loss, when ignoring the cost of law enforcement. Such a policy enhances the welfare of the new generations, but most of the times, especially when labor disutility is large, it will also be costly for some agents in the economy.

Following Becker and Murphy (1988), another solution would be to set up public transfers flowing from adults to elderly. Ricardian equivalence, would imply that transfers and education would reach an optimal level, as soon as the public upward transfers are in excess (so that they will be compensated by downward private transfers driven by altruism). However such a policy would be rather audacious. In fact altruism is a very strong theoretical idea, but it lacks of empirical support (Altonji et al., 1997). Although altruism may exist, it might not take the simplest form of Becker's theory. To base a policy on the assumption that the Ricardian equivalence holds would require a strong faith in Becker's theory of altruism.

Yet, another option, that we find more promising, consists in implementing subsidies for school enrollment in order to compensate for the opportunity cost of children. These subsidies can be financed by taxation during the adult period and can depend on the education level if an overinvestment in education is feared.

A requisite for this discussion is a better knowledge of the nature of intergenerational family ties. Recent developments in family economics tend to explore collective decision processes involving household members (see for example Browning and Chiappori, 1998). Cooperation between spouses, which is a key assumption in number of papers, is something which is intensively discussed and which has been the object of many recent empirical studies focusing on gender issues. However very few have focused on the problem of cooperation between generations. Cooperation across generations within the family seems actually even less obvious and at least as much important when human capital investments are considered.

A Proof of Proposition 3

Firms' profits will be increasing with a marginal reduction of child labor whenever the following inequality is satisfied (Baland and Robinson, 2000):

$$-\varepsilon_{c1} \leq -\varepsilon_{c2} h' \frac{w_{c2}}{w_{c1}}$$

that is when the elasticity of children's wage to child labor is lower in absolute value than the elasticity of adult wage of efficient labor to child labor times the return to human capital ($h' \frac{w_{c2}}{w_{c1}}$).

For parent's welfare, using the envelope theorem for savings adjustment, and noting W_p for $(1-\delta\lambda)W_p$, we have:

$$\begin{aligned}\frac{dW_p}{dl_c} &= U'(c_p^1)\left[w_{c1}+l_c\frac{\partial w_{c1}}{\partial l_c}\right]+U'(c_p^2)\frac{\partial\tau}{\partial l_c}\\ &\quad -\delta V_1'(1-l_c)+\delta V_2'(c_c)\left[\frac{\partial w_{c2}}{\partial l_c}h(1-l_c)-w_{c2}h'(1-l_c)-\frac{\partial\tau}{\partial l_c}\right]\end{aligned}$$

since $c_p^1=A+w_{c1}l_c-s$, $c_p^2=A-b+s+\tau$, and $c_c=w_{c2}h(1-l_c)+b-\tau$.

Using the first order condition of parents' maximization with respect to l_c,

$$U'(c_p^1)w_{c1}+U'(c_p^2)\frac{\partial\tau}{\partial l_c}=\delta V_1'(1-l_c)+\delta V_2'(c_c)[h'(1-l_c)w_{c2}+\frac{\partial\tau}{\partial l_c}]$$

we get:

$$\frac{dW_p}{dl_c}=U'(c_p^1)l_c\frac{\partial w_{c1}}{\partial l_c}+\delta V_2'(c_c)\frac{\partial w_{c2}}{\partial l_c}h(1-l_c)$$

Using the first order condition of children's maximization with respect to τ,

$$V_2'(c_c)=\lambda U'(c_p^2) \tag{15}$$

we get:

$$\begin{aligned}\frac{dW_p}{dl_c} &= U'(c_p^1)l_c\frac{\partial w_{c1}}{\partial l_c}+\delta\lambda U'(c_p^2)\frac{\partial w_{c2}}{\partial l_c}h(1-l_c)\\ &= U'(c_p^1)w_{c1}\varepsilon_{c1}-\delta\lambda U'(c_p^2)h'w_{c2}\varepsilon_{c2}\end{aligned}$$

where $\varepsilon_{c1}=\frac{\partial w_{c1}}{\partial l_c}\frac{l_c}{w_{c1}}$ and $\varepsilon_{c2}=-\frac{1}{w_{c2}}\frac{\partial w_{c2}}{\partial l_c}\frac{h}{h'}$ are the elasticities of wages to child labor. Using the first order condition on savings:

$$U'(c_p^1)=U'(c_p^2)(1+\frac{\partial\tau}{\partial s}-\delta\lambda\frac{\partial\tau}{\partial s}) \tag{16}$$

we obtain:

$$\frac{dW_p}{dl_c}=U'(c_p^2)\left[(1+\frac{\partial\tau}{\partial s}-\delta\lambda\frac{\partial\tau}{\partial s})w_{c1}\varepsilon_{c1}-\delta\lambda h'w_{c2}\varepsilon_{c2}\right]$$

Denoting $\gamma=1/\delta\lambda\in(1,+\infty)$, and using the notation $\eta=\frac{\sigma_U}{\sigma_{V_2}}=(\frac{-U''(c_p^2)}{U'(c_p^2)})/(\frac{-V_2''(c_c)}{V_2'(c_c)})$ for the ratio of absolute risk aversion at the optimum consumption levels of parents and children in the second period, we remark that $\frac{\partial\tau}{\partial s}=\frac{-\lambda U''(c_p^2)}{V_2''(c_c)+\lambda U''(c_p^2)}=-\frac{\eta}{\eta+1}$ because $\lambda=\frac{V_2'(c_c)}{U'(c_p^2)}$ by (15). Therefore $(1+\frac{\partial\tau}{\partial s}-\delta\lambda\frac{\partial\tau}{\partial s})w_{c1}\varepsilon_{c1}=\delta\lambda\frac{\eta+\gamma}{1+\eta}w_{c1}\varepsilon_{c1}$ and $\frac{dW_p}{dl_c}\leq 0$ if and only if:

$$-\varepsilon_{c2}\frac{\eta+1}{\eta+\gamma}\frac{w_{c2}}{w_{c1}}h'\leq -\varepsilon_{c1}$$

Now we look at the effect on children's welfare (noting also W_c for $(1-\delta\lambda)W_c$):

$$\begin{aligned}\frac{dW_c}{dl_c} &= -V_1'(1-l_c)+V_2'(c_c)[\frac{\partial w_{c2}}{\partial l_c}h-w_{c2}h']+\lambda U'(c_p^1)\frac{\partial w_{c1}}{\partial l_c}l_c \\ &= -V_1'(1-l_c)+\lambda U'(c_p^2)[\frac{\partial w_{c2}}{\partial l_c}h-w_{c2}h']+\lambda U'(c_p^1)\frac{\partial w_{c1}}{\partial l_c}l_c\text{, using (15)} \\ &= -V_1'(1-l_c)+\lambda U'(c_p^2)[w_{c2}(\frac{\partial w_{c2}}{\partial l_c}\frac{h}{w_{c2}}-h')+(1+\frac{\partial\tau}{\partial s}-\delta\lambda\frac{\partial\tau}{\partial s})\frac{\partial w_{c1}}{\partial l_c}l_c]\text{, using (16)} \\ &= -V_1'(1-l_c)+\lambda U'(c_p^2)[-w_{c2}h'(1+\varepsilon_{c2})+(1+\frac{\partial\tau}{\partial s}-\delta\lambda\frac{\partial\tau}{\partial s})w_{c1}\varepsilon_{c1}]\text{, using (9) and (10)}\end{aligned}$$

We know that $1+\frac{\partial\tau}{\partial s}-\delta\lambda\frac{\partial\tau}{\partial s}>0$ and $\varepsilon_{c1}<0$, so $\frac{dW_c}{dl_c}<0$ as soon as $-\varepsilon_{c2}\leq 1$.

References

Altonji, J.; Hayashi, F. and Kotlikoff, L. (1997) "Parental Altruism and Inter Vivos Transfers: Theory and Evidence", *Journal of Political Economy*; 105(6), p. 1121-66.

Basu K. (1999) "Child Labor: Cause, Consequence, and Cure, with Remarks on International Labor Standards", *Journal of Economic Literature*, 37, 1083-1119.

Basu K. and Van P. (1998) "The Economics of Child Labor", *American Economic Review*, 88:3, 412-427.

Baland J. M. and Robinson J. A. (2000) "Is Child Labor Inefficient?", *Journal of Political Economy*, 108, 4, 663-679.

Becker, G. S. (1991) *A Treatise on the Family*, 2d Ed. Cambridge Mass., Harvard University Press.

Becker, G. S., Murphy, K., (1988) "The family and the state", *Journal of Law and Economics* 31, 118.

Bergström T. (1989) “A Fresh Look at the Rotten Kid Theorem-and Other Household Mysteries”, *Journal of Political Economy,* 97(5), p. 1138-59

Browning M. and Chiappori P. A. “Efficient Intra-Household Allocation: A General Characterization and Empirical Tests”, *Econometrica,* 66(6), p. 1241-78

Dessy, S. (2000) “A Defense of Compulsive Measures against Child Labor”, *Journal of Development Economics*; 62(1), p. 261-75.

Ranjan, P. (2001) “Credit Constraints and the Phenomenon of Child Labor”, *Journal of Development Economics*; 64(1), p. 81-102.

Ravallion, M. and Wodon, Q. (2000) “Does Child Labour Displace Schooling? Evidence on Behavioural Responses to an Enrollment Subsidy”, *Economic Journal*; 110(462), p. C158-75.